

REMARKS

Claims 4-7 have been added. No new matter was added. Thus, claims 1 and 4-7 are pending in the present application. Applicant submits arguments for overcoming the rejection recited in the non-final Office Action of July 2, 2009. Accordingly, Applicant respectfully submits that the present application is in condition for allowance.

I. Claim Rejections - 35 USC §103(a)

In the non-final Office Action dated July 2, 2009, claim 1 is rejected under 35 USC §103(a) as being obvious over JP 09-260139 A of Takeda et al. in view of a 1992 publication of Bates et al. and in further view of JP 09-316630 A of Watanabe et al.

In the non-final Office Action dated July 2, 2009, the Takeda et al. reference is interpreted as disclosing the composition recited in claim 1 of the present application. For example, in the Office Action, it is stated that:

“Takeda teaches a perovskite composition $\text{La}_{1-x}\text{A}_x\text{MnO}_z$... which read onto the recited composition in the instant claim.”

“... it is noted that recited composition of the sputtering target having a general formula $\text{La}_{1-x}\text{A}_x\text{MnO}_z$ therein with $y=1.0$ (abstract, claim 2) thus Takada does not teaching away from the recited composition.”

Applicant respectfully disagrees with this interpretation of Takeda et al. and respectfully requests a fair reconsideration. More specifically, Applicant respectfully requests that the Examiner carefully study the Abstract, claims 1, 2 and 5, and Paragraph Nos. 0004, 0005 and 0009 of the Takeda et al. reference with respect to the composition required.

The Abstract of Takeda et al. states, as follows:

“An oxide which has a Perovskite structure $\text{La}_{1-x}\text{A}_x\text{MnO}_3$... whose main elements are La and Mn and **which conforms an inequality: $\text{Mn}/(\text{La}+\text{A}) < 1$** and which is expressed, for instance, by a formula: $\text{La}_{1-x}\text{A}_x\text{Mn}_y\text{O}_z$ (wherein $0.7 \leq y < 1.0$)”.

Independent claim 1 of Takeda et al. states, as follows:

“... perovskite structure $\text{La}_{1-x}\text{A}_x\text{MnO}_z$... characterized by composition ratios of Mn and (La+A) being $\text{Mn}/(\text{La}+\text{A}) < 1$ ”.

Claim 2 of Takeda et al. is dependent upon claim 1 and includes all the limitations of claim 1 and states, as follows:

“The magnetoresistance effect type element according to claim 1...”.

Independent claim 5 of Takeda et al. states, as follows:

“A general formula $\text{La}_{1-x}\text{A}_x\text{Mn}_y\text{O}_z$... $0.7 < y < 1.0$ ”.

Paragraph No. 0004 of Takeda et al. states, as follows:

“... perovskite structure $\text{La}_{1-x}\text{A}_x\text{MnO}_z$... composition ratios of Mn and (La+A) are $\text{Mn}/(\text{La}+\text{A}) < 1$.”

Paragraph No. 0005 of Takada states, as follows:

“General formula: $\text{La}_{1-x}\text{A}_x\text{Mn}_y\text{O}_z$ (however, $0.7 \leq y < 1.0$)”.

Paragraph No. 0009 of Takada states, as follows:

“General formula: $\text{La}_{1-x}\text{A}_x\text{Mn}_y\text{O}_z$... $0.7 \leq y < 1.0$ ”.

Accordingly, the Abstract, claims 1, 2 and 5, and Paragraph Nos. 0004, 0005 and 0009 of Takeda et al. each clearly requires that $\text{Mn}/(\text{La} + \text{A})$ must not equal 1. Also, each clearly requires $\text{La}_{1-x}\text{A}_x$. Thus, “1-x-x” equals 1, and therefore, the “y” in Mn_y must equal less than 1.

The Examiner cites the Abstract; however, the Abstract clearly requires $\text{Mn}/(\text{La}+\text{A}) < 1$ and $\text{La}_{1-x}\text{A}_x\text{Mn}_y\text{O}_z$ (**wherein $0.7 \leq y < 1.0$**). In addition, the Examiner cites claim 2 of the Takeda et al. reference. However, basic patent law dictates that dependent claim 2 includes all

the limitations of its base claim and any intervening claim (claim 1). Independent claim 1 of Takeda et al. clearly requires $Mn/(La+A) < 1$.

Thus, Takeda clearly teaches to one of ordinary skill in the art that the main elements must conform an inequality in which $Mn/(La + A)$ is less than one. Accordingly, if $(La+A)$ equals “ $1-x+x$ ” or “1”, then Mn_y requires “y” to equal less than one. This is the only fair interpretation of disclosure provided by the Takeda et al. reference. Keep in mind, claim 2 of Takeda et al. must include all the limitations recited in claim 1, and claim 1 of Takeda et al. has already limited “y” to be less than 1 based on its requirement that $Mn/(La + A)$ is less than one.

In contrast, claim 1 of the present application requires $Ra_{1-x}A_xMnO_{3-a}$. From this required formula, it is clear that $Mn/(Ra + A)$ must be equal to one. Thus, Takeda et al. requires the opposite to that required by claim 1 of the present invention. Accordingly, the teaching provided by Takeda et al. to one of ordinary skill in the art teaches-away from that required by the present invention. “Teaching away” is the antithesis of the art suggesting that the person of ordinary skill in the art go in the claimed direction. Essentially, “teaching away” is a per se demonstration of lack of obviousness. In re Fine, 873 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

For at least the above reason, Applicant respectfully submits that the rejection and reasons stated in the Office Action for the rejection must be withdrawn. Takeda et al. clearly do not disclose the composition required by claim 1 of the present application. Accordingly, Applicant respectfully submits that claim 1 is patentable and is not obvious over Takeda et al. in view of the Bates et al. and Watanabe et al. references. Applicant respectfully requests reconsideration and removal of the rejection for at least this reason.

Further, it is acknowledged in the Office Action that Takeda et al. fail to disclose the resistivity, relative density and purity characteristics required by claim 1 of the present application. With respect to resistivity, the Office Action relies on a modification of Takeda et al. in view of the teachings in the Bates et al. publication.

Turning to Bates et al., it discloses compositions under Section 2 “Synthesis and Processing”, Sub-Section 2.2 “Glycine-Nitrate Process” which include $\text{La}_{0.5}\text{Sr}_{0.5}\text{MnO}_3$ and $\text{La}_{1-x}\text{Sr}_x\text{MnO}_3$ where “x” equals 1.0 to 3.0. Pages 240 and 241 of Bates et al. also disclose compositions of $\text{Y}_{1-x}\text{Ca}_x\text{MnO}_3$ and $\text{Y}_{1-x}\text{Sr}_x\text{MnO}_3$. However, Bates et al. disclose a sintered body in which powder manufactured according to a Glycine-Nitrate Process (GNP) is sintered via an atmospheric sintering process. This is an entirely different manufacturing process relative to that of the present invention, which is stated, for instance, on pages 3 and 4 of the present application, as filed.

Applicant respectfully submits that even if the sputtering target of Takeda et al. is manufactured according to the GNP and atmospheric sintering of Bates et al., the sputtering target having the properties required by claim 1, such as resistivity, cannot be achieved and/or obtained. Thus, for at least this reason, the rejection should be withdrawn.

Also, Applicant respectfully submits that Bates et al. clearly fail to disclose or render obvious a sintered compact body or sintered body sputtering target that has the average crystal grain size required by claim 1 of the present application. Lines 2-3 of the Abstract of the Bates et al. publication clearly states that: “The *resulting powders* ... vary in size between 1 and 100nm”. In contrast, claim 1 of the present application requires the sintered body sputtering target to have the required grain size, not raw material powder. The size of the raw material powder provides no indication or disclosure of the average crystal grain size of a sintered

compact body. Thus, the target of Takeda et al. as modified according to Bates et al. would clearly be different to that of the present invention.

Also, claim 1 of the present application requires the sputtering target to have a relative density of 95% or more. Bates et al. on page 237, under section 3 “Air-sintering of *chromites*”, first paragraph, line 8-9; first paragraph under section 3.2 and Fig. 2; First line, page 239” of the Bates et al. publication disclose density characteristics. However, all these statements of Bates et al. are made with respect to $Y_{1-x}Ca_xCrO_3$ or $La_{1-x}Ca_xCrO_3$. For example, Section 3 of Bates et al. is titled “Air-Sintering of *Chromites*” and the disclosure provided by the entire section is limited to *chromites*. Further, in the Abstract of Bates et al., high density is referenced, but only in connection with “*chromite* powders”. Accordingly, Applicant respectfully submits that Bates et al. clearly fail to disclose or render obvious a sintered body sputtering target made of $Ra_{1-x}AxMnO_{3-\alpha}$ having the required relative density. Thus, the target of Takeda et al. as modified according to Bates et al. would clearly be different to that of the present invention.

In the Office Action, the claim limitation in the present application requiring the sputtering target to have a resistivity of $10\Omega\text{cm}$ or less is stated as being disclosed by converting the electrical conductivity of FIG. 6 of the Bates et al. publication. FIG. 6 of Bates et al. is limited in disclosing electrical conductivity of $Y_{1-x}Ca_xCrO_3$. In the case of Cr, Bates et al. teach that it is possible to obtain high conductivity since the ion radius of the bivalent positive ions coincide with the ion radius of the respective constituent elements. However, this clearly would not apply to the composition having Mn required by claim 1 of the present application. It would be clear to one of ordinary skill in the art that a perovskite oxide containing Mn will not have an electrical conductivity that is equivalent to a perovskite containing Cr.

Further, Bates et al. disclose that the electrical properties of Mn will change considerably based on the sintering conditions and the like. See page 240, Section 4, of the Bates et al. publication. Bates et al. teach sintering in air at 1550°C. In contrast, the present application requires the sputtering target to be sintered under an inert gas atmosphere, such as Ar gas, at 800 to 1500°C. See page 3, line 27, of the present application, as filed.

As stated above, the composition of the sputtering target of claim 1 of the present application is required to be $Ra_{1-x}A_x\text{MnO}_{3-a}$. It is not a chromite. In addition, the sintering conditions required in the present application are different than those taught by the Bates et al. publication. Bates et al. acknowledge that electrical properties will change considerably based on sintering conditions and the like.

Accordingly, Applicant respectfully submits that the target of Takeda et al. as modified according to Bates et al. would clearly fail to render obvious a sintered body sputtering target made of $Ra_{1-x}A_x\text{MnO}_{3-a}$ having the required resistivity. Applicant respectfully requests reconsideration of the rejection of claim 1 for at least this reason.

Still further, in the Office Action, the Watanabe et al. reference is relied upon for meeting the requirements of claim 1 relative to purity and relative density.

Turning to Watanabe et al., it discloses a chemical composition of an oxide that is entirely different to that required by claim 1 of the present application. Accordingly, there is no technical justification that characteristics such as relative density, purity, and grain size, which are indicated as being controllable in Watanabe et al., are similarly controllable in the present invention. Applicant respectfully submits that one of ordinary skill in the art would not be able or find it obvious to successfully divert the technology of Watanabe et al. to the present invention.

Although the BaSrTiO₃ disclosed by Watanabe et al. has an oxygen defect formed as a result of being subject to vacuum hot pressing, it subsequently becomes an n-type semiconductor. All the Examples of Watanabe et al. perform vacuum hot pressing. Thus, the formation of an oxygen defect (loss) by vacuum hot pressing is a necessity for the material system of the Watanabe et al. reference.

In contrast, the material system of the present invention is a p-type semiconductor, and the formation of an oxygen defect reversely deteriorates the electrical conductivity. Thus, vacuum hot pressing is not performed. As described above, since the characteristics of the materials are clearly different between that of Watanabe et al. and that of the present invention, it would not be obvious for one of ordinary skill in the art to divert the technology disclosed by Watanabe et al. to achieve or obtain the present invention as recited in claim 1.

One of ordinary skill in the art recognizes that Watanabe et al. discloses a type 2-4 perovskite oxide formed from bivalent Ba and Sr and quadrivalent Ti. In contrast, the perovskite oxide of $Ra_{1-x}A_xMnO_{3-\alpha}$ required by claim 1 of the present application has a so-called laminated perovskite of type 3-3. Accordingly, Applicant respectfully submits that one of ordinary skill in the art would avoid combining the teachings of the perovskite oxide of Watanabe et al. with that of Takeda et al. and Bates et al. based on the different perovskite structure and the different components of the oxide. Any combination would certainly not be obvious. Further, the deficiencies of Takeda et al. and Bates et al. concerning average crystal grain size, relative density, and resistivity of a sputtering target formed of perovskite oxide of $Ra_{1-x}A_xMnO_{3-\alpha}$ are certainly not disclosed or obviated by the Watanabe et al. reference.

Thus, one of ordinary skill in the art is provided with no common sense reason or teaching from the references for providing a sputtering target specifically requiring the target to

be formed of $Ra_{1-x}A_xMnO_{3-0}$ in which “Ra” represents a rare earth element consisting of Y, Sc and lanthanoid, “A” represents Ca, Mg, Ba or Sr, and $0 < x \leq 0.5$, and in which the sputtering target has a relative density of 95% or more, an average crystal grain size of $100\mu m$ or less, a resistivity of $10\Omega cm$ or less, and a purity of 3N or more.

For all the above reasons, Applicant respectfully submits that claim 1 of the present application would not be obvious to one of ordinary skill in the art based on a combination of Takeda et al. in view of Bates et al. and further in view of the Watanabe et al. reference. Further, Applicant respectfully submits that it would not be obvious to combine these references, and that even in the event the teachings were somehow combined, the present invention and characteristics required by claim 1 of the present application would not be achievable.

As best stated on page 2, lines 8-10, of the present application, as filed: “the improvement of density in this kind of target existed as an *extremely formidable challenge*.” Based on the inventor’s significant inventive contribution, the present invention provides a sputtering target that inhibits the occurrence of fractures and cracks and inhibits the generation of particles during sputtering. Thus, the present invention greatly improves yield with respect to manufacture and use of the target and greatly improves the quality of the film deposited via DC or RF sputtering and reduces the generation of defective products.

The cited references neither disclose nor render obvious the inventor’s contribution as recited in claim 1 of the present application. At the time of the invention, one of ordinary skill in the art is simply not enabled by the cited references to produce a sputtering target required by claim 1. Accordingly, Applicant respectfully submits that the art of sputtering targets for use in sputtering thin films has been advanced, that the invention is meritorious, and that claim 1 is worthy of allowance.

For these reasons, Applicant respectfully requests reconsideration of the references and rejection and submits that claim 1, as amended, is patentable over Takeda et al. in view of Bates et al. and further in view of the Watanabe et al. reference. Accordingly, Applicant respectfully requests removal of the rejection.

II. New Claims

New dependent claims 4-7 have been added. No new matter was added. See claim 1 and pages 3-14 of the present application, as filed. The dependent claims limit the elements that “A” and “Ra” represent.

III. Conclusion

In view of the above arguments and remarks, Applicant respectfully submits that the rejections have been overcome and that the present application is in condition for allowance. Thus, a favorable action on the merits is therefore requested.

Please charge any deficiency or credit any overpayment for entering this Amendment to our deposit account no. 08-3040.

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